CLAIMS

What is claimed is:

1. A method comprising:

transmitting a first signal including a data signal from a client to a headend via a transmission channel;

processing said first signal to produce a second signal including a known sequence of symbols;

generating a transmission channel model of said transmission channel independent of a noise characteristic utilizing said second signal;

applying said known sequence of symbols to an input of said transmission channel model;

comparing an output of said transmission channel model to said first signal; and

dynamically estimating a noise characteristic of said data signal at said headend in response to said comparison.

2. The method as set forth in claim 1, wherein transmitting a first signal including a data signal from a client to a headend via a transmission channel comprises:

modulating said data signal and said known sequence of symbols within said client; and

transmitting said data signal and said known sequence of symbols substantially simultaneously from said client to said headend via said transmission channel.

3. The method as set forth in claim 2, wherein:

processing said first signal to produce a second signal including a known sequence of symbols comprises demodulating said first signal to extract said known sequence of symbols, and further wherein:

applying said known sequence of symbols to an input of said transmission channel model comprises applying said extracted known sequence of symbols to said input of said transmission channel model.

4. The method as set forth in claim 2, wherein:

processing said first signal to produce a second signal including a known sequence of symbols comprises:

storing said known sequence of symbols within a memory within said headend;

locating a nominal position of said known sequence of symbols within said first signal;

correlating said first signal with said known sequence of symbols utilizing said nominal position; and

retrieving said known sequence of symbols from said memory in response to said correlation, and further wherein:

applying said known sequence of symbols to an input of said transmission channel model comprises:

applying said retrieved known sequence of symbols to said input of said transmission channel model.

5. The method as set forth in claim 1, wherein said transmission channel model comprises a finite impulse response filter having a plurality of coefficients and generating a transmission channel model of said transmission channel independent of a noise characteristic utilizing said second signal comprises calculating a value for each of said plurality of coefficients of said finite impulse response filter utilizing a least-squares algorithm.

6. The method as set forth in claim 1, wherein dynamically estimating said noise characteristic of said data signal at said headend in response to said comparison comprises estimating an ingress characteristic and a thermal noise characteristic of said data signal.

7. The method as set forth in claim 1, wherein comparing an output of said transmission channel model to said first signal comprises:

synchronously sampling said first signal relative to a symbol rate of said known sequence of symbols and removing a carrier frequency of said first signal to produce a third signal; and

comparing an output of said transmission channel model to said third signal.

8. The method as set forth in claim 5, said method further comprising reducing said noise characteristic of said data signal utilizing said dynamic estimate.

9. The method as set forth in claim 8, wherein reducing said noise characteristic of said data signal utilizing said dynamic estimate comprises:

configuring a filter having a plurality of coefficients;

determining a value for each of said plurality of coefficients; and

modifying said data signal utilizing said filter to reduce said noise characteristic of said data signal.

10. The method as set forth in claim 9, wherein configuring a filter having a plurality of coefficients comprises configuring a filter having a plurality of coefficients utilizing an impulse response of said transmission channel model.

11. The method as set forth in claim 10, wherein:

configuring a filter having a plurality of coefficients comprises configuring a decision-feedback equalizer within said headend, and further wherein:

modifying said data signal utilizing said filter to reduce said noise characteristic of said data signal comprises adaptively filtering said data signal utilizing said decision-feedback equalizer to reduce said noise characteristic of said data signal.

12. The method as set forth in claim 10, wherein:

configuring a filter having a plurality of coefficients comprises:

receiving a pre-equalizer architecture parameter associated with a pre-equalizer within said client; and

generating a pre-equalizer configuration for said pre-equalizer utilizing said pre-equalizer architecture parameter, and further wherein:

modifying said data signal utilizing said filter to reduce said noise characteristic of said data signal comprises imposing distortion on said data signal utilizing said pre-equalizer prior to transmission to reduce said noise characteristic of said data signal.

13. The method as set forth in claim 9, wherein determining a value for each of said plurality of coefficients comprises calculating a value for each of said plurality of coefficients utilizing a Wiener-Hopf equation.

14. A communications network comprising:

a client to transmit a first signal including a data signal via a transmission channel, said client including:

a modulator to modulate said data signal and a known sequence of symbols; and

a transmitter to transmit said modulated data signal and known sequence of symbols substantially simultaneously via said transmission channel;

a headend to receive said first signal via said transmission channel and to dynamically estimate a noise characteristic of said data signal at said headend, said headend including:

a transmission channel model of said transmission channel independent of a noise characteristic to receive a known sequence of symbols;

a processor to process said first signal to produce a second signal including said known sequence of symbols and to provide said known sequence of symbols to said transmission channel model utilizing said second signal; and

a comparator to compare an output of said transmission channel model and said first signal and to dynamically estimate said noise characteristic of said data signal in response to said comparison.

15. The communications network as set forth in claim 14, wherein said noise characteristic comprises an ingress characteristic and a thermal noise characteristic of said data signal.

16. The communications network as set forth in claim 14, wherein said transmission channel model comprises a finite impulse response filter.

17. The communications network as set forth in claim 14, wherein said processor to process said first signal to produce a second signal including said known sequence of symbols and to provide said known sequence of symbols to said transmission channel model utilizing said second signal comprises a bulk demodulator.

18. The communications network as set forth in claim 14, said communications network further comprising a memory to store said known sequence of symbols wherein said processor to process said first signal to produce a second signal including said known sequence of symbols and to provide said known sequence of symbols to said transmission channel model utilizing said second signal comprises a processor to:

locate a nominal position of said known sequence of symbols within said first signal;

correlate said first signal with said known sequence of symbols utilizing a nominal position of said known sequence of symbols within said first signal; and

retrieve said known sequence of symbols from said memory in response to a correlation of said first signal with said known sequence of symbols.

19. The communications network as set forth in claim 14, said communications network further comprising a filter having a plurality of coefficients to reduce said noise characteristic of said data signal utilizing said dynamically estimated noise characteristic.

20. The communications network as set forth in claim 19, said communications network further comprising a processor to configure said filter and to determine a value for each of said plurality of coefficients.

21. The communications network as set forth in claim 20, wherein said processor to configure said filter comprises a processor to generate a filter configuration for said filter utilizing an impulse response of said transmission channel model.

22. The communications network as set forth in claim 21, wherein said filter to reduce said noise characteristic of said data signal comprises a decision-feedback equalizer within said headend of said communications network to adaptively filter said data signal to reduce said noise characteristic of said data signal utilizing said dynamically estimated noise characteristic.

23. The communications network as set forth in claim 21, wherein said filter to reduce said noise characteristic of said data signal comprises a pre-equalizer within said client of said communications network to impose distortion on said data signal prior to transmission of said data signal to reduce said noise characteristic of said data signal utilizing said dynamically estimated noise characteristic.

24. The communications network as set forth in claim 23, wherein said processor to generate a filter configuration for said filter comprises a processor to receive a pre-equalizer architecture parameter associated with said pre-equalizer and to generate a pre-equalizer configuration for said pre-equalizer utilizing said pre-equalizer architecture parameter.

25. A headend comprising:

a receiver to receive a first signal including a data signal from a client via a transmission channel;

a transmission channel model of said transmission channel independent of a noise characteristic to receive a known sequence of symbols;

a processor to process said first signal to produce a second signal including said known sequence of symbols and to provide said known sequence of symbols to said transmission channel model utilizing said second signal; and

a comparator to compare an output of said transmission channel model and said first signal and to dynamically estimate a noise characteristic of said data signal in response to said comparison.

26. The headend as set forth in claim 25, wherein said noise characteristic comprises an ingress characteristic and a thermal noise characteristic of said data signal.

27. The headend as set forth in claim 25, wherein said transmission channel model comprises a finite impulse response filter.

28. The headend as set forth in claim 25, wherein said receiver comprises a receiver to receive a pre-equalizer architecture parameter associated with a client pre-equalizer; said headend further comprising a processor to generate a pre-equalizer configuration for said client pre-equalizer utilizing said pre-equalizer architecture parameter.

29. A machine-readable medium having a plurality of machine-executable instructions embodied therein which when executed by a machine, cause said machine to perform a method comprising:

receiving a first signal including a data signal via a transmission channel;

processing said first signal to produce a second signal including a known sequence of symbols;

generating a transmission channel model of said transmission channel independent of a noise characteristic utilizing said second signal;

applying said known sequence of symbols to an input of said transmission channel model;

comparing an output of said transmission channel model to said first signal; and

dynamically estimating a noise characteristic of said data signal at said headend in response to said comparison.

30. The machine-readable medium as set forth in claim 29, wherein dynamically estimating said noise characteristic of said data signal at said headend in response to said comparison comprises estimating an ingress characteristic and a thermal noise characteristic of said data signal.

31. The machine-readable medium as set forth in claim 29, wherein said method further comprises reducing said noise characteristic of said data signal utilizing said dynamic estimate.